DOCUMENT RESUME

ED 394 730 PS 024 197

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TITLE	Impact of Early Education on School Performance and Productivity.
INSTITUTION	High/Scope Educational Research Foundation, Ypsilanti, Mich.
SPONS AGENCY	World Bank, Washington, D. C.
PUB DATE	Feb 96
NOTE	26p.
PUB TYPE	Reports - Research/Technical (143) -- Information Analyses (070)
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Academic Achievement; At Risk Persons; Child Development; Cost Effectiveness; Developing Nations; Developmental Stages; *Early Childhood Education; *Educational Opportunities; Human Capital; Infants; Language Acquisition; *Outcomes of Education; *Poverty; Preschool Children; *Preschool Education; Productivity; *Program Effectiveness; Toddlers
IDENTIFIERS	*Adult Performance Level; Developmentally Appropriate Programs; Developmental Theory; High Scope Demonstration Preschool Project; Long Term Effects; Project Head Start

ABSTRACT

This report examines how early educational opportunities affect child development and eventually adult productivity. The report also discusses some implications for developing countries. The effectiveness of educational programs for infants to 2.5-year-olds has not yet been demonstrated. However programs that ensure health, nutrition, immunization, and related issues are very effective in increasing infant physical growth and well-being. The effectiveness of preschool programs (for children 2.5 through 6 years of age) has been demonstrated, most notably by the evidence provided by the Head Start program. High-quality early childhood education is associated with fewer instances of poverty. Lessons for developing countries include: (1) educational programs for children aged 2.5 to 6 years of age are an important educational investment in the fight against poverty; (2) teaching children 2.5 to 6 years old didactically, no matter how logical it is to adult planners and administrators, is counterproductive. (Contains 5 selected readings and a list of 50 references.) (JW)

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Impact of Early Education on School Performance and Productivity

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Introduction

There is fundamental logic behind the belief that providing children with early stimulation and improved opportunities will create better performance later on, as they tackle the demands of life. In the adult world, we have many examples to support such a conclusion. Workers do better when they have had systematic training in specific job-performance requirements before undertaking new work; in sports, at any level of skill, team members are better players when they have had adequate practice; and people in general—be they potters, farmers, machine tool designers, medical doctors, or teachers—seem to accomplish tasks more easily and at a higher level when they have had some earlier related experiences.

The same logic would seem to hold true regarding education of children and youth. Indeed, many cultures have folk sayings equivalent to "As the twig is bent, so grows the tree." We wish to have children read and comprehend the written word so they may be independent learners and communicate easily; we wish to have children understand the fundamentals of mathematics so they can navigate the higher-order science and technology important to modern society. Therefore, if we are interested in school performance on academic subjects and if we are concerned about productivity in society, it makes sense to focus on the goals we desire and to get about the task of teaching children what they need to know to reach these goals. Further, it would seem that the earlier we do this, the better.

But with children—things do not work that way!

They do not work that way because the child, an extraordinarily complex organism, matures differentially throughout childhood and adolescence. To be ready for adult life, children need to grow through various stages of physical, mental, and emotional development, each characterized by unique needs and tasks that support overall growth. The growth years, however, accomplish a great deal more than preparation for academic performance and adult productivity. They include physical growth from a weak infant with barely functioning, poorly integrated systems to an independent teen with skillful and integrated physical abilities. They include psychological growth from the total dependence of an infant to the emerging independence of an adolescent to the full independence of responsible adulthood. Children's growth years include development of integrated sound and visual patterns by the infant to produce the adolescent who can read, create, manage language, compute, relate to others, and think logically. Thus, the rationale easily applied to adults—teach 'em what they gotta know—is not useful when applied to children. It does not take into account that the child (infant through adolescent) is in transition and that different teaching and learning strategies are required at different periods of growth. Thus, we can build on traditional ways of preparing children for adult life, or we can begin to understand the possibilities that are suggested by careful research supporting alternative strategies.

This paper primarily looks at one basic issue—what we know about how child development blends with opportunity-to-learn to produce a long-lasting impact on education and, eventually, on adult productivity. To do this, we first track a typical pattern in the search for

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quality of service programs, then look at age-appropriate education. Although the field is suffering from the lack of high-quality longitudinal research, enough information is available to judge the impact of educational intervention between birth and age 2½, between ages 2½ and 6, and between ages 7 and 10. After the limited evidence concerning the most effective curriculum approach is reviewed, this paper closes with a look at the lessons for developing countries, especially with regard to the age at which educational intervention should begin.

A Brief History of the Search for Service Quality

Over the last 35 years, high-quality educational programs have struggled to find acceptance as a priority for young children. As part of gaining that acceptance, professionals in the field have recognized the need to define what is meant by a "high-quality" early childhood program. Historically, initial efforts to achieve quality have focused on regulation of the health, safety, and nutrition aspects of programs. This first step is typical of emerging programs in all countries. Gradually, however, it becomes clear that as difficult and complex as their achievement may be, health, safety, and nutrition standards are not sufficient to insure high-quality early childhood program operation and outcomes. Once this is recognized, the search for quality expands to introducing standards for teacher qualifications—stipulating the training required for program staff. This second step encourages establishment of preservice staff-training programs to meet the new standards. This done, the focus gradually shifts to a third step, recognition of the need for comprehensive services for the children and families' participating in the program. New standards requiring such services are then created.

While this cycle of program evolution is found in most countries, it is often the case that finances, cultural traditions, religion, or other pressing national concerns alter the shape of efforts to establish program quality. Unfortunately, while these steps outline important areas essential for providing high-quality education to children and their families, they are insufficient to achieve the goal. To reach the goal of providing high-quality programs, a validated, well-implemented, educational methodology must be employed, usually in the form of a model curriculum. As yet however, this fourth step is not widely recognized as essential.

An Example

The United States has closely followed the cycle that we have described here. Many early childhood programs were started to provide adult employment during the Depression, and they continued during World War II to provide care while mothers worked. Most of these programs closed down soon after the war, but a few nursery schools at major universities survived to serve as research and teacher-training laboratories. At first, the major focus in these demonstration programs was on children's safety, personal health habits, and social adjustment to both peers and adults. Sears and Dowley (1963) at Stanford University described the goals of their demonstration nursery school program in such terms. When early childhood programs began to expand again in the early 1960s, state regulation became the basis of program operation. The focus was primarily on children's health and safety, and little interest was shown in the actual curriculum used in such programs.

In 1965, the national Head Start program changed the situation by introducing three important elements into early childhood programs. First, as a national program, it introduced education standards for Head Start staff and encouraged inservice training programs to assist staff in meeting those standards. Second, Head Start implemented a requirement that its grantees provide comprehensive service programs that included extensive parent involvement. Finally, the Head Start standards insisted that programs for children be based on *learning through play*—making Head Start the first large-scale program to move beyond children's health, safety, and social adjustment as goals.

Now in the 1990s, new findings have pointed to the importance of early childhood education: First, when programs operate at a sufficiently high level of quality, the value to participating children is extraordinary, with the impact extending into adulthood. Second, an essential ingredient of a high-quality program is the actual curriculum in which the children participate. It is striking to note that neither of these claims could be made only a few years ago. The first claim is illustrated by the outcomes of the widely known High/Scope Perry Preschool Project—a study that has followed children from a preschool program as they have grown into 27-year-old adults. The second claim is supported by a look at the new outcomes from the High/Scope Preschool Curriculum Comparison study, in which the participants are now 23 year olds. Before looking at these findings, this paper explores information about age-appropriate education and its implications for educational content at different stages of children's development. This issue is discussed from the perspective of child development theory. As shown later in the paper, there is every reason to be doubtful about theoretical approaches such as Direct Instruction (based on learning theory) and similar teacher-centered forms of instruction.

Age-Appropriate Education

While there are many approaches, most child development theories are based on the idea that growth occurs in specific stages. Piaget defined a set of stages that is widely used—sensorimotor (0 to 2½ years), preoperational (2½ to 6 years), concrete operational (7 to 10 years), and formal operational (11 years and up). Neo-Piagetians, like Donaldson (1978), caution that while useful, Piaget's age-ranges must be considered as very flexible. Children develop and mature at different rates, depending on their inborn nature and the range of opportunities provided in their specific environments. Some 3-year-olds, for example, may still be very much sensorimotor learners—they might spin the wheels on a truck just to see them spin rather than to use them as a way to move the vehicle. A few 3-year-olds are advanced and think and express themselves using the language and logic that characterize concrete operational learners; such children, for example, may teach themselves to read. Using age as a general rather than a strict guideline and looking at how children learn, we next examine key organizing principles for educational programs and what children learn across developmental stages. Figure 1 on the next page summarizes the three stages we will be discussing. There are implications for teaching and learning that are specifically determined by children's development at each of the Piagetian stages.

Figure 1

Organization Principles Birth Through Age 10			
	Sensorimotor Years	**Preoperational Years**	**Concrete Operational Years**
	Age 0 to 2½ Years	**Age 2½ to 6 Years**	**Age 7 to 10 Years**
How Children Learn	Direct experience, active learning; interaction with adult caregivers	Direct experience, active learning; verbal reflection; making decisions	Direct experience, active learning; verbal reflection; making decisions; generative use of direct information
Key Program Element	Interactive play based on child's interest	Plan-do-review; represent: tell, draw, invented writing	Plan-do-review; represent: tell, draw, build, write, compute
What Children Learn	Explore physical reality; develop trust, autonomy, initiative, empathy	Language; explore classification, seriation, number, space, time, music movement; develop curiosity, initiative, interests, friendships	Reading, science, math, writing, movement, music, art, drama; develop social network

Language and Experience Are Basic

From birth, direct experience with language profoundly impacts children's learning and social development. Sensorimotor and preoperational children develop language through a complex process that is both genetic and environmental. Basically, very young children acquire words to match their expanding experience and knowledge of their particular world. They build this understanding and use of language through trial-and-error experiences with people and materials. For example, a child learns what "hot" means through direct, tactile experiences with hot water, stoves, lighted candles, and so forth. The suggestion "Twist the block, then it will fit in the hole" makes sense only when the child has matched the block and the hole many times through trial and error. Children understand words based on their own experiences, and they in turn use words to convey and reflect their own understanding.

Direct experience of the physical world is essential to children's growth and development. Observation and listening are important, but only as elements of direct physical experience with people, materials, events, and ideas. While adolescents can wrestle with concepts, theories, and hypotheses and with symbols like pictures, written words, and recorded images, all these abstractions are not in themselves sufficient for learning.

How Children Learn

A developmental approach assumes that direct experience and active learning are absolutely essential at all stages of children's growth. This is in contrast to the tendency in schools and in society at large to gradually substitute passive experiences for active ones and to gradually encourage indirect rather than direct experiences. The movie *Lawrence of Arabia*, for example, creates a vivid image of the Sinai Desert and the privations people may undergo as they cross it. Simply watching Lawrence and his men suffer from lack of water and searing heat, however, does not evoke genuine understanding in a viewer sitting in an air-conditioned theater sipping an iced soft drink. Unless you have experienced profound thirst, you cannot truly understand the actual suffering of those who made the journey. While this is an adult example, we must accept as principle that children need direct experiences to learn what things really are and what effects they produce. Children do not know how to pour water into a container until they have played with water and various containers over and over. It will not do simply to tell them, or to offer a visual demonstration, or even to provide a one-time play opportunity.

For the *sensorimotor* (infant-toddler) child, an essential aspect of direct experience and active learning is ongoing interaction with positive, supportive adult caregivers. Infants and toddlers need eye contact, "partnered" communication, touching, and close body-contact with adults. Realizing this, most adults rock babies; pat their backs to a steady beat; and bathe, feed, care for, and play with them. These interactions with attentive adults are critical to children's learning and social development. How these interactions are accomplished differs, of course, from culture to culture.

Rapid verbal development distinguishes the *preoperational* (preschool) child. In addition to offering children direct experience and active learning, providing support for their verbal reflection and independent decision-making becomes increasingly important. While children communicate and follow their interests from birth onward, the opportunity for reflecting on their experiences in their own words and making their own decisions are additional ingredients for preoperational growth and development. For example, when a child engages in a conversation about a topic of personal interest and an attentive adult listens, comments, and asks a related open-ended question, the child has the opportunity to think aloud, decide the direction and content of the conversation, and experience adult respect and partnership.

At the *concrete operational* (primary school) stage, children are developing the capacity to use written words as tools for learning. It is important at this point, however, that adults do not substitute reading and writing for experience-based learning. In learning reading and writing, children need to continue constructing their own understanding of words and making decisions about how to use what they know and understand. While adults can and must provide information to children, it is most effective to turn that information over to children to use for themselves. For example, an adult might suggest, "Tap your shoulders and then your knees," in developing a steady beat exercise that many children would never discover or invent on their own. But following this with the question "What other parts of your body can you tap?" turns control over to the children, who can then generate their own creative solutions. Or, an adult might introduce a science concept: "Seeds grow and create new plants. What conditions make

seeds sprout and grow? Let's find out." If the children are ready for science problems, then they are ready to generate their own solutions.

Providing information to concrete operational children is easy. Creating a supportive, active learning environment where they can use information to generate their own solutions is the challenge. Otherwise, schooling breaks down. Adults, textbooks, and tests take control over learning, and students become bored. On the other hand, when students put new information to use, they actively engage in making decisions and constructing knowledge. In this context, test scores, while useful for some accounting or screening needs, are virtually irrelevant indicators of children's success. Rather, it is children's capacity to plan, try out ideas, think about them, and express their findings that build success and competence.

A Key Program Element: Plan-Do-Review

During the *sensorimotor* period, infants and toddlers need to play to develop a sense of independence and to explore things that attract their attention. However, simply having a rich environment with ample opportunity to explore is not sufficient. Children also need to interact in two-way communication with positive, supportive adults. By taking turns with the child, observing and following his interests and initiatives, and allowing him to control the pace of events, adults support, use language, and respond to the child's needs. The child, in turn, develops a sense of trust and initiative.

During the *preoperational period*, the plan-do-review sequence supports actions initiated by the preschooler. Adults encourage children to plan—to express their intentions—by asking, for example, "What do you think you will do with all those blocks?" Children then carry out their intentions or plans, and this *do* stage may last a few minutes or more than an hour. Dramatic play involving several children, "cooking" to "feed" fellow playmates, or creating block structures and drawings are the types of things that occur during the *do* stage. After each work period, adults encourage children to *review* their experiences. The children may talk about what they did or express themselves in drawing or in "writing." In so doing, children begin to exercise memory skills and develop insight about their experiences.

To ensure that direct experience and active learning are not neglected, the plan-do-review sequence continues to be important for *concrete operational* (primary school) children. At this more mature level, children are increasingly able to express their plans and evaluations in writing. They are beginning to be able to verify their findings; use the scientific method to construct knowledge; and present ideas and experiences in speeches, dramatic presentations, summary charts, and written documents.

What Children Learn

As sensorimotor infants and toddlers explore their worlds, they are learning about physical reality. Since everything they encounter is brand new to them, they have to discover things for themselves by tasting, chewing, smelling, pushing, pulling, banging, throwing, holding, hearing, and seeing. When they explore the physical world with the full support of caregivers who play with and care for them as partners, infants and toddlers also begin to relate to people in a way

that allows them to form a positive, hopeful view of themselves and trustful relationships with others.

The *preoperational* (preschool) child is involved in matching language to actions and finding out about the physical world from a more logical perspective, with a focus on relationships in the areas of classification, seriation, number, space, and time. The child can use materials, toys, and tools; work next to and in partnership with others; and relish the joy of trying things out and making them work through trial and error. Out of these active experiences come dispositions to be curious, to initiate relationships with others, and to enjoy exploring and learning. Strangely, it is not only the actual knowledge of logical relationships gained during this period, but also the manner in which children interact with people, materials, events, and ideas to gain this knowledge, that is critical to preoperational learning and its lifelong consequences.

At the *concrete operational* (primary school) level, children are still grounded in experience and physical reality. The content of their knowledge, however, shifts increasingly toward the abstract as they become involved with the collective wisdom of various disciplines as it has been recorded through the ages and interpreted by different cultures. As adults present this more formal content, they tend to lecture to students, when in fact these older children still need to wrestle with new information through direct experience, active learning, and verbal reflection. They still need to make decisions, generate alternatives, talk and work in groups, and exploring hypothetical situations. Again, it is the meshing of appropriate content with the experience of active learning that leads to thinking and releases children's energy and innate drive.

Of these three stages—sensorimotor (infant-toddler), preoperational (preschool), concrete operational (primary school)—which is most important? Is there any intervention at these stages that has any value later, especially for educational performance and adult productivity? The next section of this paper examines the information on these two issues for each of the age groups.

Infant-Toddler Programs: Evidence of Effectiveness (Birth to Age 2½)

With the growing awareness of the long-term impact of high-quality preschool programs, some suggest that if intervention could be provided from birth, problems of developmental lag and inadequate growth could be avoided. If preschool education is effective at ages 2½ to 6, programs from birth to age 2-1/2 would make success even more possible. After all—that is what middle-class advantaged children experience. However, effectiveness of infant-toddler educational programs has not yet been satisfactorily demonstrated. So far, little or no evidence is available to support the hypothesis that intervention from birth to age 2½ will alone improve the educational performance and social growth of the child in later years. The available evidence indicates a limited contemporary effect from the best programs, but no long-term results even a year later, let alone extending into primary school and adulthood; typical infant-toddler programs fail to find even that much effect. This is not to say that this stage is not important and that normal development cannot go awry. It is to say that what will produce normal skill development between birth and age 2½ has so far seemed to be available to most children. It is

important to note, however, that programs insuring health, nutrition, immunization, and related issues are very effective in increasing infant physical growth and well-being.

Perhaps one of the most carefully controlled studies and one of the earliest was the High/Scope Carnegie Infant Education Project (Lambie, Bond, & Weikart, 1974). Initiated in the fall of 1967, this project enrolled 88 infants and their mothers from disadvantaged families in Ypsilanti, Michigan. The infant-mother pairs were assigned at random to one of three conditions: a treatment group who received weekly home visits by staff professionals, a contrast group who received weekly home visits by community volunteers, and a control group who received no services. Infants entered the program at either 3, 7, or 11 months of age and participated for 16 months. This design permitted the study of both type-of-treatment and age-of-entry. Of the 88 children enrolled, 65 completed the full 16-month project.

The project had a comprehensive research design, and the progress of both mothers and infants was carefully followed. The findings at the end of the project were most encouraging: "Over all testpoints, . . . there were significant program effects: Infants in the experimental group scored significantly higher on the average than children in either the contrast or control groups." However, "One year after the program terminated, the treatment group differences on the Stanford-Binet Intelligence Scale did not reach . . . statistical significance" (Lambie et al., 1974, p. 116). Because this project was designed as a longitudinal study, the children and their mothers were followed up again when children were in second grade (age 7). As found in this follow-up, "Significant group differences . . . favoring the experimental treatment group at the end of the program were no longer present five years later" (Epstein & Weikart, 1979, p. 41). The findings of this project unfortunately are reflected in the findings concerning most work with parents and infants to date.

Because the High/Scope Carnegie Infant Education Project was exploring new ground in providing educational service to infants and their mothers, later efforts were perhaps more effective. Major efforts have been mounted under a variety of auspices. Most notable was the multiyear, multiproject Ford Foundation Child Survival/Fair Start (CS/FS) project (Larner, Halpern, & Harkavy, 1992). This project was a multisite undertaking with teams of local practitioners and researchers in seven diverse communities developing and implementing preventive programs for parents and their infants. The primary goal was ". . . a preventive focus on pregnancy and infancy, offering education, support (to families), and information about appropriate services" (p. 7). The programs spanned age 10 months to age 2½ years. Reflecting the surprising lack of findings for such a major program with outstanding staff talent and funding resources, the research team of High/Scope evaluators contracted by the Ford Foundation summarized the study outcomes under the heading "Modest Outcomes." They said, "Clearly there are limits to the benefits we can expect to see from participation in comparatively modest, multipurpose programs like the CS/FS programs" (p. 245). What "modest" findings there were occurred in the health care and parent-education areas, not in child development.

A general review of all such studies was recently published by the Center for the Future of Children. St. Pierre, Layzer, and Barnes (1995) summarized the research programs with

parents and infants, including those programs that went on to include preschool services. The review looked at all the major projects of the 1980s and 1990s, including the Avancé Family Support and Education program begun in the 1970s and offering programs in the Southwest; the Child Family Resource Program, which operated nationally at 11 sites between 1973 and 1983; the Comprehensive Child Development Program, which began in 1990 with 34 project sites nationally; the Even Start Family Literacy Program, which started in 1990 with 400 local projects; Head Start Family Service Centers, which began in 1990 and has 66 sites; and New Chance, which operated from 1989 to 1992 at 16 sites. These programs provided comprehensive services including parent education and literacy training with support to the children. All were evaluated.

These projects operated without the usual limitations of funds; some programs cost as much as $13,000 to $16,000 per family, whereas the more typical program costs were in the $2,000 to $4,000 range. Nevertheless, the overall results were limited. St. Pierre et al. (1995) summarized the findings tersely: "Evidence about the short-term effects of two-generation programs is mixed . . . . As currently designed, two-generation programs have small short-term effects on a wide set of measures of child development" (p. 89). These are hardly results that social planners and policymakers can use to justify the expenditure of limited funds on such efforts. And "small, short-term effects" rarely precede greater differences at a later time.

The possibility of gaining improved educational performance and better productivity through programs for infants and toddlers would appear limited. While new program delivery methods and new insights gained from basic research into physical development may open new avenues, the current approaches appear exhausted. Again, it should be noted that there is success at this age in delivering health, nutrition, and other basic needs services. The apparent uniform, limited findings on educational and social development gains to date should in no way interrupt these other basic programs. The findings on preschool programs are in sharp contrast to those on infant and toddlers. Preschool findings are presented next.

Preschool Programs: Evidence of Effectiveness (Ages 2½ to 6)

Examination of the literature reveals that evidence for the effectiveness of high-quality preschool programs for children living in poverty comes from a range of sources. The Head Start Synthesis Project meta-analysis of all available studies of Head Start's effects (McKey, et al., 1985) identified 50 studies that found evidence of immediate improvements in children's intellectual performance, socioemotional performance, and health, and these lasted several years. It also found that these Head Start programs provided and linked families with health, social, and educational services and influenced various institutions to provide such services. Ramey, Bryant, & Suarez (1985) identified another 11 experimental studies in which the mean intelligence test scores of children who participated in preschool programs were as high as or higher than the mean intelligence test scores of children in the studies' control groups. Lazar, Darlington, Murray, Royce, and Snipper (1982) analyzed data from the constituent studies of a collaborative effort called the Consortium for Longitudinal Studies. They reported findings of positive program effects on intelligence test scores at school entry, on special education placement, and

on grade retention. Barnett (1995) presented the most recent survey of the most relevant studies. Finally, Myers (1995) summarized studies on all aspects of early childhood development research from throughout the world.

Several specific studies providing information on preschool effectiveness include Ramey, Bryant, Campbell, Sparling, and Wasik (1988); Gray, Ramsey, and Klaus (1982); Palmer (1983); Garber (1988); Levenstein, O'Hara, and Madden (1983); Monroe and McDonald (1981); Lally, Mangione, and Honig (1988). Large-scale individual studies include Fuerst and Fuerst (1993), and Irvine (1982). All the programs examined in these individual longitudinal studies served young children living in poverty and at special risk of school failure. Children entered the programs at some time between birth and age 5 and remained in them at least for a single school year and at most through nearly their entire early childhood, from birth to school entry. In some of these studies, assessment has not yet progressed beyond early childhood, while in others, follow-up has continued up to age 21. All these studies were able to follow up on at least 70% of the original study participants.

Each of these individual studies that collected data on early childhood intellectual performance found its program group to have a significantly higher mean intellectual performance score than its no-program group ($p < .05$, two-tailed), at least during the program and shortly thereafter. Some studies reported that significantly fewer program-group than no-program-group members were ever placed in special education classes. The magnitude of the special education percentages in each study was a function of the initial degree of risk of school failure for the participants in that study. Some studies reported that significantly fewer program group than no-program group members were ever retained in grade. Some studies found the program group to have a significantly higher rate of high school graduation than the no-program group.

Fade-out of Preschool Program Effects

Although some have claimed that most effects of good preschool programs for children in poverty fade away (e.g., McKey et al., 1985), there is virtually no evidence of fade-out of the effect on children's special education placement, high school graduation, or delinquency. Fade-out evidence is mixed for effects on children's socioemotional behavior and school achievement. Clear evidence of fade-out has been found only for gains in children's intelligence-test scores. In the 1960s, the hypothesis was that though early educational programs were found to raise young children's test scores, subsequent educational programs would not affect them. Instead, it may be argued that a difference in intelligence-test scores reflects a difference in educational settings. When children who *have* attended preschool programs and children who *have not* attended preschool programs come together into the same standard elementary school classrooms, their intelligence test scores also come together.

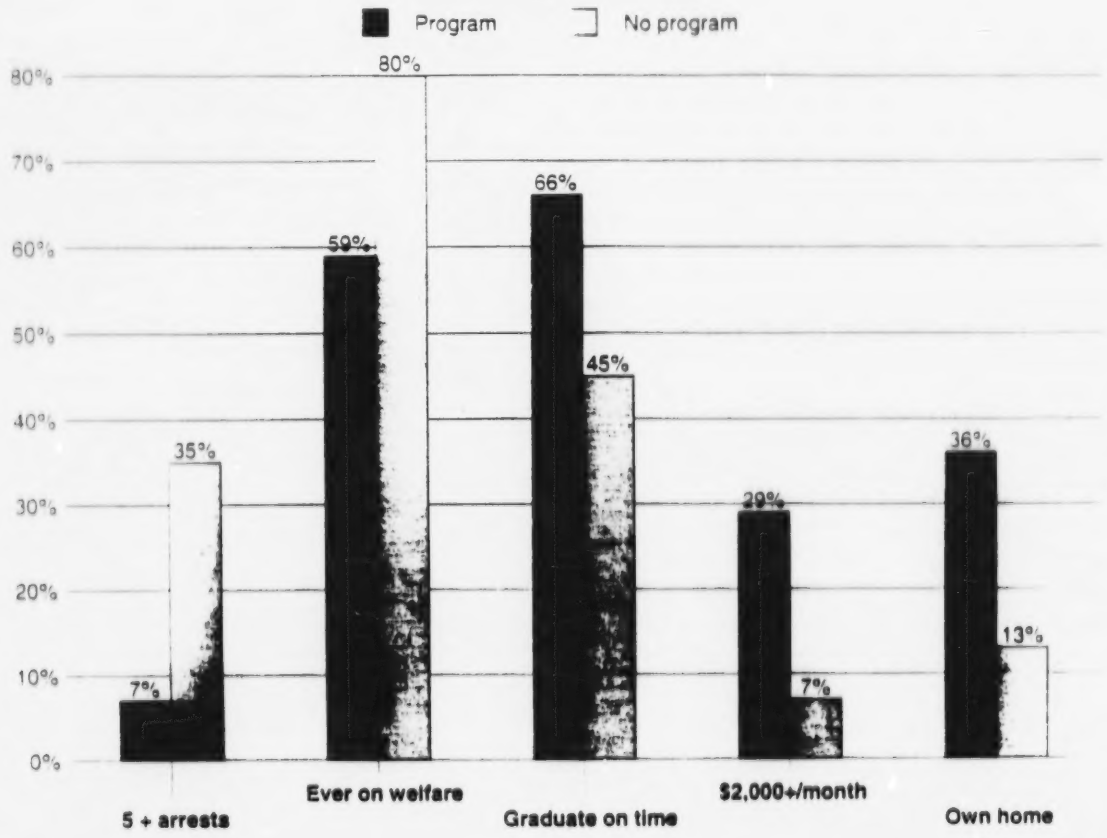
The High/Scope Perry Preschool Study

By virtue of its careful experimental design and long-term duration, the evaluation of the High/Scope Perry Preschool program is one of the most thorough examinations of program effects ever undertaken (Schweinhart, Barnes, & Weikart, with Barnett and Epstein, 1993). The

basic evaluation question is whether the High/Scope Perry Preschool program affected the lives of participating children. The study focused on 123 African-Americans born in poverty and at high risk of failing in school. In the early 1960s, at ages 3 and 4, these children were randomly divided into a program group (who received a high-quality, active-learning preschool program) and a no-program group (who received no preschool program). The two groups have been carefully studied over the years. At age 27, 95% of the original study participants were interviewed, and additional data were gathered from their school, social services, and public records. Post-preschool differences between the groups represent preschool program effects (see Figure 2).

Figure 2

Major Findings at Age 27



Note: From *Significant Benefits* (p. xvi) by L. J. Schweinhart et al., 1993, Ypsilanti, MI: High/Scope Press. Copyright 1993 by High/Scope Educational Research Foundation. Adapted with permission.

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The following findings about preschool program effects were statistically significant (with a two-tailed probability of less than .05):

- **Social responsibility**: By age 27, only one-fifth as many program group members as no-program group members were arrested 5 or more times (7% vs. 35%), and only one-third as many were ever arrested for drug dealing (7% vs. 25%).

- **Earnings and economic status**: At age 27, four times as many program group members as no-program group members earned $2,000 or more per month (29% vs. 7%). Almost three times as many program group members as no-program group members owned their own homes (36% vs. 13%), and over twice as many owned second cars (30% vs. 13%). Three-fourths as many program group members as no-program group members received welfare assistance or other social services at some time as adults (59% vs. 80%).

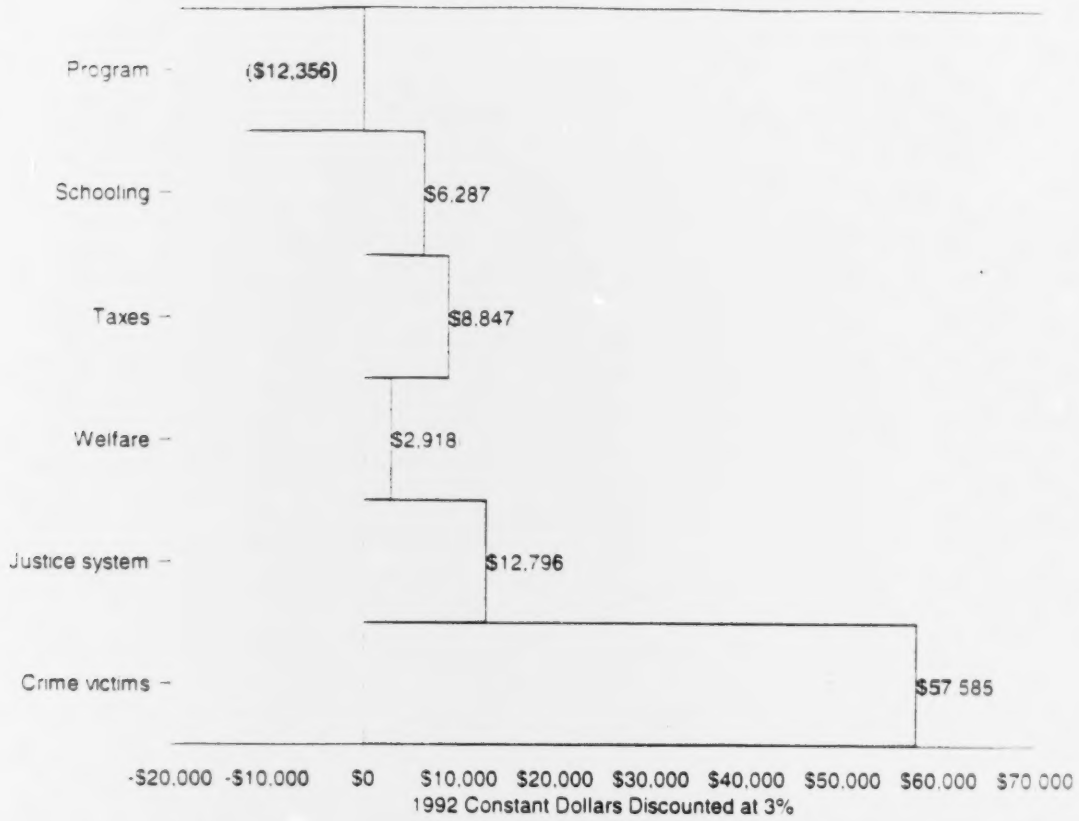
- **Educational performance**: One-third again as many program group members as no-program group members graduated from regular or adult high school or received General Education Development certification (71% vs. 54%). Earlier in the study, the program group had significantly higher average achievement scores (at age 14) and literacy scores (at age 19) than the no-program group.

- **Commitment to marriage**: Although the same percentages of program males and no-program males were married (26%), the program males were married nearly twice as long as the no-program males (an average of 6.2 years vs. 3.3 years). Five times as many program females as no-program females were married at the time of the age-27 interview (40% vs. 8%). Program females had only about two-thirds as many out-of-wedlock births as did no-program females (57% of births vs. 83% of births).

- **Return on investment**: A benefit-cost analysis was conducted by estimating the monetary value of the program and its effects, in constant 1992 dollars discounted annually at 3% (see Figure 3 on the next page). Dividing the $88,433 in benefits per participant by the $12,356 in cost per participant results in a benefit-cost ratio of $7.16 returned to the public for every dollar invested in the High/Scope Perry Preschool program. This return substantially exceeds all earlier estimates. The program was an extremely good economic investment, better than most other public and private uses of society's resources. By increasing the number of children per adult from 5 to 8, the program's cost per child per year could be reduced, with virtually no loss in quality or benefits.

Figure 3

Return to Taxpayers on Per-Participant Investment



Note: From *Significant Benefits* (p. 168) by L. J. Schweinhart et al., 1993, Ypsilanti, MI: High/Scope Press. Copyright 1993 by High/Scope Educational Research Foundation. Adapted with permission.

Early childhood education, when offered as a high-quality program, is a powerful antidote to poverty. Such programs are obviously not the single solution. For example, not *all* children who attended the Perry Preschool program benefitted or graduated from high school, and as adults, 71% earned less than $2,000 a month. Yet, program participation did improve the life chances of participants and did significantly reduce the pool of those needing additional help or creating major social problems for the community.

Since educational programs at ages 2½ to 6 (the preoperational level of development) have proved to be effective, the question now is this: Is intervention at preschool age *all* that is needed, and does it matter which educational approach is used? The next section considers this question.

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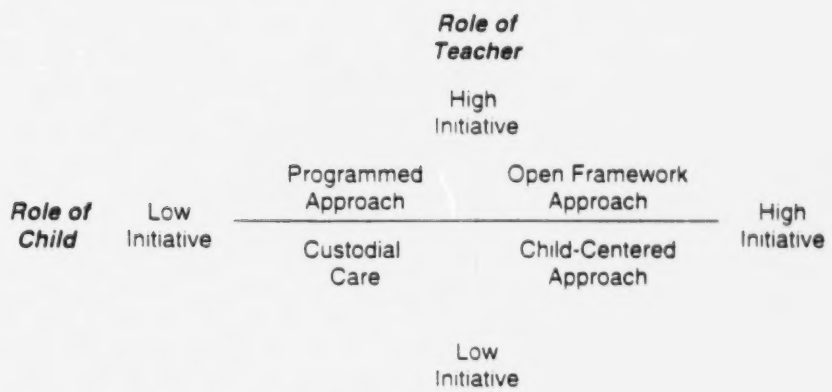
Curriculum Models: Input and Its Impact on Educational Outcomes

The various educational approaches used with children generally fall into four different categories, as shown in Figure 4. Use of these categories permits curriculum model description and research to proceed with greater efficiency. While this categorization pattern was first described by Weikart (1972), other observers have used essentially the same pattern for categorizing early childhood curricula (Kohlberg & Mayer, 1972) and parenting styles (Baumrind, 1971). The organizing principle behind this pattern is that in a learning situation, the teacher/adult and the child can each take a role of either high or low initiation, depending on the intention of the curriculum theory employed.

Figure 4
Preschool Curriculum Models



In the *programmed approach*, which includes methods drawn from learning theory, the typical role of the teacher is to determine and then initiate the required learning activities; the role of the child is to respond and to learn from what the teacher offers, not to initiate individual learning or activities. These curricula include clearly defined objectives; incorporate carefully designed, programmed sequences to move children toward these objectives; and provide teachers with explicit instructions for implementing the sequences. Content usually emphasizes specific preacademic skills. Learning is viewed as the acquisition of "correct" responses with respect to the programmed-instruction goals. It is assumed that if the behavioral objectives are specific enough, virtually anything can be taught to almost any child through the use of appropriate behavior-modification techniques.

In the *open-framework approach*, which is based on development theory, it is the role of both teacher and child to initiate learning activities. The primary educational objective for the child is the development of fundamental cognitive processes and concepts, rather than specific skills (although it is assumed that specific skills will be acquired during general development). Learning results from the child's intended, direct experience in and action upon the environment.

followed by shared reflection on the experience. Learning is not viewed as accumulation of specific bits of information, as in the programmed learning approach. The open-framework curriculum is generally based on an explicit theory of child development (e.g. the High/Scope Curriculum draws on Piagetian theory). This theory provides a decision-making framework for teachers without specifying the day-to-day content of the programs. Children identify the content and interests that are of most importance to them, and learning occurs through the child's active and largely intrinsically motivated involvement in an environment structured and observed by the teacher.

In the *child-centered approach*, which is based on social development and maturation theories, the child typically initiates learning by playing, and the teacher's role is to respond to the child's particular interests and activities. The great majority of preschool programs around the world would describe themselves as being in this category. Characterized by a focus on the development of the "whole child," such programs emphasize social and emotional growth and self-expression, rather than acquisition of specific preacademic skills or cognitive development. Classroom environments are typically open and, ideally, rich in stimuli. The relationship between teacher and child tends to be permissive. Content revolves around topics of interest to the child that support general socialization-enculturation, opportunities for children's independent and creative activities, and opportunities for children's exploration and development of healthy peer-relationships.

The *custodial approach* has the teacher/adult providing basic care while the children entertain themselves. In some cases—in programs that focus on specific health and nutrition goals—the children remain passive in cribs or certain sections of the room, waiting for the next event—toileting, snack time, etc.; unless called for by schedule, there is little interaction between caregiver and children. Often there is little activity undertaken by children. This approach—which has no basis in theory—is not recommended.

The next section looks at the research undertaken to examine the differential impact of these approaches. Carrying out such program-comparison research is more difficult than implementing research on a single program. Because equality in the programs must be maintained and random assignment of participants is essential, few studies are able to meet the required criteria.

Preschool Curriculum Comparison Studies

Three long-term studies. Three long-term preschool curriculum comparison studies begun in the 1960s focused on children living in poverty and included Direct Instruction (the programmed approach), the High/Scope Curriculum (the open-framework approach), and traditional Nursery School programs (the child-centered approach). The studies are the *High/Scope Preschool Curriculum Comparison Study* (Schweinhart & Weikart, in press), the *University of Louisville study of Head Start* (Miller & Bizzell, 1983; Miller & Dyer, 1975), and the *University of Illinois study* (Karnes, Schwedel, & Williams, 1983; Karnes, Teska, & Hodgins, 1970). All three studies collected a variety of measures on intellectual performance, as well as interview and records data.

All three studies found that children in Direct Instruction programs initially outperformed children in child-centered and other programs on various measures of intellectual performance, but that these significant differences appeared only during the program and up to a year afterward. In other words, the widely observed pattern of IQ improvement followed by fade-out (mentioned on p. 10) applied to the preschool programs involved in these three long-term studies. In the Illinois study, the high school graduation rates of study participants were noticeably if not significantly different across program types—70% for the child-centered program group, 48% for the Direct Instruction program group, and 47% for the no-program group. However, among these three studies, only the High/Scope Preschool Curriculum Comparison Study (to be discussed in more detail on pp. 17–19) met the criteria for random assignment of sample.

The Planned Variation Head Start study. In the late 1960s, national Head Start began a long-term study to examine the effects of different curriculum model approaches. This 1969-72 Planned Variation Head Start project included a dozen preschool curriculum models at 37 sites with some 6,000 children enrolled in model programs (Bissell, 1971; Datta, McHale, & Mitchell, 1976; Smith, 1973; Weisberg, 1973). Among the dozen models studied were the Direct Instruction model (programmed approach); the High/Scope model (open-framework approach); and an "Enabler model," which resembled the traditional child-centered approach. Although study participants were in Head Start, they were nevertheless heterogeneous in family socioeconomic status and initial intellectual performance. Despite the study's many design problems, two clear findings emerged. First, on the postprogram *achievement tests*, children in Direct Instruction and other programmed-learning programs had higher scores than children in any of the other programs or in any of the comparison groups. Second, in *intellectual performance*, children in High/Scope programs had greater gains. High/Scope program children gained an average of 23 points on the Stanford-Binet Intelligence Scale, while children in other models gained no more than 5 points.

Recent short-term preschool studies. A number of early childhood curriculum comparison studies have been conducted. Burts, Charlesworth, Hart, and their associates (Burts et al., 1992; Burts, Hart, Charlesworth, & Kirk, 1990; Charlesworth et al., 1993) have engaged in a program of research based on assessing teachers' developmentally appropriate beliefs and practices, as defined by the National Association for the Education of Young Children (Bredekamp, 1987), and related child outcomes. "Developmentally appropriate practice" corresponds to the High/Scope and child-centered models, while "developmentally inappropriate practice" corresponds in many ways to the Direct Instruction model. Examining a sample of 37 kindergarten children, they found that those in a developmentally inappropriate class exhibited significantly more stress behaviors (such as complaints of feeling sick, stuttering, fights, tremors, nervous laughter, and nail biting) than did those in a developmentally appropriate class (Burts et al., 1990). They replicated this finding with a sample of 204 kindergarten children and found these curriculum group differences to be most pronounced for males and for African-American children, the categories of children most likely to experience Direct Instruction classes (Burts et al., 1992).

DeVries and her associates systematically observed three kindergarten classes—one used Direct Instruction; another used an open-framework approach like High/Scope's; and the third was eclectic. Analyzing teachers' interactions with children, they found that the open-framework teacher significantly surpassed the other two in her use of reciprocal and collaborative negotiation strategies and shared experiences (DeVries, Haney, & Zan, 1991). Analyzing children's interactions with each other during two game-like activities, they found that compared with children in the Direct Instruction and eclectic programs, children in the open-framework program were more interpersonally interactive and had a greater number and variety of negotiation strategies and shared experiences (DeVries, Reese-Learned, & Morgan, 1991). Although *before* kindergarten and in first grade, the Direct Instruction class had significantly higher achievement-test scores than did the open-framework class, these significant differences between the two classes disappeared by third grade.

Comparative curriculum research is important to the extent that the curriculum models compared represent the choices actually made by early childhood teachers. Marcon (1992, 1994) identified three different preschool models operating in the Washington, DC, public schools—teacher-directed, child-initiated, and "middle-of-the-road"—and examined the development of a random sample of 295 children attending these types of programs. The teacher-directed programs resembled Direct Instruction, and the child-initiated programs resembled High/Scope. Children from the various types of classes differed significantly in their mastery of basic reading, language, and mathematics skills, with children from child-initiated classes showing the greatest mastery of these skills, followed by children from teacher-directed classes, then children from "middle-of-the-road" classes (Marcon, 1992). Although not statistically significant, this same ranking of curriculum types appeared later in children's fourth-grade grade point averages overall and in most subject areas (Marcon, 1994).

In the High/Scope Training of Trainers Evaluation, Epstein (1993) found that compared with children in nominated high-quality classes not using the High/Scope Curriculum, children in High/Scope classes were rated significantly higher at the end of the school year in their initiative, social relations, music and movement skills, and general development. In another study of the effects of the High/Scope Curriculum, Frede and Barnett (1992) found that preschool programs throughout South Carolina that were implementing the High/Scope Curriculum moderately to very well contributed more to children's school achievement at kindergarten and first-grade entry than did programs with low implementation levels. With these general findings as a base, the next section looks at a long-term study specifically designed to ask the question of model effectiveness in reaching improved education and adult productivity goals.

The High/Scope Preschool Curriculum Comparison Study

The High/Scope Preschool Curriculum Comparison study began in 1967. The project employed a stratified random-assignment procedure to assign 68 disadvantaged 3- and 4-year-old children (both African-American and White) living in Ypsilanti, Michigan, to each of three curriculum models: Direct Instruction (programmed approach), High/Scope (open-framework approach), and traditional Nursery School (child-centered approach). The children attended school for one or two years. Children in each group attended a daily 2½-hour classroom session and received a

home visit to involve their parents for 90 minutes every other week. Findings for curriculum-group differences through age 23 concerning education, household, and life adjustment (particularly the number of criminal arrests) are now available and are summarized here. Comparisons can be drawn between these findings and those of the High/Scope Perry Preschool study.

Education. Only one significant group difference in total scores took place during the study through age 23: The Direct Instruction group surpassed the traditional Nursery School group at the end of the preschool program, at age 5, on the Stanford-Binet Intelligence Scale. The larger finding from tests is the extraordinary increase in the mean IQ of the whole sample of children, whatever curriculum model they experienced. From the age-3 baseline mean IQ of 78, the three curriculum groups together at age 4, after one year of the preschool programs, evidenced an improvement of 26 points. This improvement diminished by 9 points during the subsequent six years, but held steady at 17 points above the baseline at ages 6, 7, and 10—a pattern of sustained improvement that contradicted the expected IQ fade-out mentioned on p. 00.

However, regarding educational achievement, despite the Direct Instruction group's two years of intense academic preparation, all three groups performed essentially the same on academic tests throughout their school years. The Direct Instruction group experienced significantly more years of special education for emotional impairment or disturbance—over one year per member; members of the other two groups experienced almost no special education. Members of the Direct Instruction group failed almost twice as many classes as did members of the other two curriculum groups, a difference that was not statistically significant but that was consistent with the Direct Instruction group's nonsignificant pattern of a lower rate of on-time high school graduation.

Household. Age 23 is at the very beginning of adult life and is still very much a transitional period. The striking evidence is that nearly half the respondents (47%) were, at age 23, living with their mother and/or father, that is to say, living in their home of origin. Curriculum groups differed significantly in the percentages of members married and living with their spouses: 0% of the Direct Instruction group, as compared with 18% of the Nursery School group and 31% of the High/Scope group. This finding resembles the High/Scope Perry Preschool study findings that 40% of program females but only 8% of no-program females were married at age 27 ($N = 49$, $p = .036$).

Life adjustment (criminal arrests). The Direct Instruction group experienced over twice as many *lifetime arrests*, including twice as many adult arrests, as either of the other two curriculum groups—a nearly significant difference for both variables. The Direct Instruction group averaged 3.2 lifetime arrests per person as compared with 1.5 for the High/Scope group and 1.3 for the Nursery School group. In the High/Scope Perry Preschool study, the number of estimated average lifetime arrests by age 23 was 1.8 for the program group and 3.5 for the no-program group (halfway between ages 19 and 27). This comparison suggests that the Direct Instruction program did not lead to more arrests, but neither did it lead to fewer arrests as the other preschool programs did.

Most important, the Direct Instruction group had significantly more felony arrests than the other curriculum groups—four times as many as the other groups combined. These differences appeared in felony arrests from ages 22 to 25, as the number of these arrests grew more substantial. Forty-three percent of Direct Instruction group members had felony arrest records as compared with only 10% of the High/Scope group and 17% of the Nursery School group.

The Direct Instruction group also identified significantly more *sources of irritation* in the community (the interview item read "different types of people . . . giving you a hard time lately") than did the High/Scope group. The most frequent sources of irritation for these sample members were collection agencies, work supervisors, police, courts, and family members. The prominence of police and courts, particularly for the Direct Instruction group members, corroborates the findings of differences in numbers of felony arrests.

Finally, the Direct Instruction group reported being *suspended from work* significantly more often than did either of the other two curriculum groups—0.6 times per group member as compared with almost no work suspensions in the other groups.

Curriculum Models and Program Quality

This study suggests that using specific curriculum models that support children's initiative is essential to having high-quality preschool programs that produce lasting benefits. In particular, it suggests that preschool teachers who use Direct Instruction with young children living in poverty are pursuing a very risky path. Programs and teachers who want to produce the effects that are found to result from a particular curriculum model must commit to following the curriculum model. Research findings regarding program effects can be generalized *only to programs that are essentially the same as the programs studied.* But following a curriculum model does not require abandoning intelligent judgement, as some scholars have suggested (Goffin, 1993; Walsh, Smith, Alexander, & Ellwein, 1993). Situations in preschool programs are constantly changing; teachers must apply principles intelligently to these situations, or the principles are reduced to mindless reactions. On the other hand, while this study suggests that conventional early childhood wisdom in on the right track, it hardly substantiates every idea that a good early childhood educator ever had.

For one thing, this study should dispel any belief that home visits and teacher-parent contacts alone make the difference between programs that have lasting beneficial effects and those that do not. Bi-weekly home visits were as much a part of the Direct Instruction program as they were of the others. Nevertheless, this study does leave open the question of whether substantial outreach to parents is *one* of the aspects of a curriculum model that can reinforce its lasting benefits. Had the parents not been full partners in the implementation of the child-centered and open-framework curriculum models with their children, perhaps these curriculum groups would not have differed significantly from the Direct Instruction group in their average number of felony arrests at age 23.

This High/Scope Preschool Curriculum Comparison study supports advocacy of open-framework education over Teacher Directed (programmed) instruction for young children. It

identifies the High/Scope Curriculum and to some extent the traditional Nursery School approach as particular methods of education that develop in children the decision-making capacity and social skills needed for responsible adult life. It indicates that these approaches help prevent crime. It shows that choice of a curriculum model is an important factor in determining the quality of early childhood education.

Primary School Programs: Evidence of Effectiveness (Ages 6-10)

Once the child has entered the concrete operational years (the primary school period) most countries begin a formal schooling process. While Scandinavian countries wait until children are 7 years of age, most countries encourage school enrollment at age 6. Many industrialized countries offer reception classes at age 5 as well. The debate in these countries has not been about *whether to offer* such programs; after all, if children are not given the opportunity to learn, they cannot learn. Instead the debate has been over *the best way to operate* such programs. As in early childhood education, there are strong traditions of what is accepted as best practice. While much of the early childhood field in one way or another is now committed to child-initiated learning, the primary school is usually operated with a strong focus on direct instruction (by teacher or books). In the United States one major project, called *Follow Through*, has spent over 25 years tackling the issue of how to operate primary school programs and has had inconclusive results. In 1967 the federal government established a large-scale experiment in multiple sites to examine the impact of different curriculum models on elementary school performance. While never exceeding 137 sites, the Follow Through project attracted much attention from serious curriculum model developers (Rhine, 1981).

Follow Through. The Follow Through project was intended to provide former Head Start children with kindergarten through third-grade "follow-through," to avoid the presumed fade-out of Head Start effects (Zigler & Muenchow, 1992). During its existence from 1967 to 1995, Follow Through never served more than a small fraction of the nation's children who had attended Head Start. It did, however, serve as a development and proving ground for 20 early elementary curriculum models, including the Direct Instruction and High/Scope models. Unfortunately, the study, using many sites of varying quality, could not answer this question: Which curriculum model, carried out as prescribed under ideal conditions, is most effective in achieving its declared objectives—and in achieving the widely agreed-upon objectives for programs that educate young children? If a curriculum model is found to be effective under ideal circumstances, then its diminished effectiveness in other circumstances might clearly be attributed to implementation under less-than-ideal conditions. One of the general conclusions of Follow Through was that program outcomes varied more across different sites than across different curriculum models (Stebbins, St. Pierre, Proper, Anderson, & Cerva, 1977).

Judging from the many cross-national studies of the International Association for the Evaluation of Educational Achievement (IEA), we can conclude that *opportunity to learn* is one of the major issues in educational achievement and adult productivity (Elley, 1992; Robitaille & Garden, 1989). But, the data from the IEA studies and the findings from Follow Through provide no clear direction about what specific approach should be used in primary schools. From the child development point-of-view, the concrete operational child can apparently successfully work

within a wide range of educational models. However, the quality of the overall situation seems to take priority over the quality of the specific method used. As alternative approaches to educational instruction become better developed, clearly preferred educational methods for the primary school will most likely emerge. However, all agree that without some formal opportunity to engage knowledge, it is unlikely that children on their own will reinvent the necessary disciplines. Thus, schooling is clearly important.

Lessons for Developing Countries

Lessons for developing countries are straightforward. Children 2½ to 6 years old who participate in high-quality, active learning programs in any context (family, home care, center-based) where they have the opportunity to choose activities and independently develop their choices, will be better students in school and more productive citizens as they mature. Teaching children of this age didactically, no matter how logical it is to adult planners and administrators, is counter-productive. Investment in educational programs for children from birth to age 2½ has not yet been shown to be advantageous, although programs at that age can be effective as delivery systems for health, nutrition, and various family support requirements. Investment in educational programs for children 7 to 10 years old, the traditional age for exposure to educational content, needs no defense. But even at this age, one might question whether didactic methods of instruction are the best choice.

Finally, a word about the benefit-cost analyses of early childhood program provision: The cost savings that has been found in an industrial country with a well-developed social service program, schools for all, and many job opportunities, may not all translate to a developing country. However, having more productive and responsible citizens as an outcome of providing high-quality programs for young children is a benefit that any country might welcome.

* * *

Selected Reading

This list gives several of the most important current books or resources for the early childhood field. They present a range of projects and issues that may be of importance to the reader.

1. Epstein, A. S., Larner, M., & Halpern, R. (1995). *A guide to developing community-based family support programs*. Ypsilanti, MI: High/Scope Press.
   This guide draws from the operational knowledge obtained from the 7 Ford-Child Survival/Fair Start sites and the 7 High/Scope Parent-to-Parent sites (based on the High/Scope/Carnegie-Infant Education Project). These 13 projects worked under many different auspices and under differing circumstances. The authors have drawn together practical, operational knowledge and experience from these sites that would facilitate the implementation of community-based, family-support programs that work with infants and preschool-aged children.
2. Myers, R. (1995). *The twelve who survive: Strengthening programmes of early childhood development in the Third World* (2nd ed.). Ypsilanti, MI: High/Scope Press.
   This is the most comprehensive book available summarizing research projects and policies from around the world with special focus on the developing countries. The case studies and summaries of research projects given are most helpful in understanding both national differences and the needs of children and families.
3. Behrman, R. E., (Ed.). (1995, Winter). *The future of children. Long-term outcomes of early childhood programs* (Vol. 5, No. 3). Los Altos, CA: The David and Lucille Packard Foundation.
   This volume of this publication gives a comprehensive review of the issues in providing programs for young children. It looks at a wide variety of topics ranging from the operational-research programs to specialized issues such as health insurance. There is a chapter on international aspects that draws upon the experiences of other countries as well.

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4 Schweinhart, L. J., Barnes, H. V., & Weikart, D. P., with Barnett, W. S., and Epstein, A. S. (1993). *Significant benefits: The High/Scope Perry Preschool study through age 27* (Monographs of the High/Scope Educational Research Foundation, 10). Ypsilanti, MI: High/Scope Press.
This monograph reports the findings of the High/Scope Perry Preschool Project through age 27. It gives a detailed look at the study's methodology and the results obtained from the study. Of special importance is the benefit-cost analysis that considers the financial issues of providing high-quality programs such as the High/Scope Perry Preschool program.

5 Rhine, W. R. (Ed.). (1981). *Making schools more effective: New directions from Follow Through*. New York: Academic Press.
This book reviews all the major models in national Follow Through. Each model program is authored by its model developer, and there are sections on research relevant to that model.

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